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| U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER TAKEDA 11 |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/762202 |
| INTERNATIONAL APPLICATION NO. PCT/JP99/07350 | INTERNATIONAL FILING DATE 27 December 1999 | PRIORITY CLAIMED 03 June 1999 |
| TITLE OF INVENTION MOBILE COMMUNICATION UNIT WITH BONE CONDUCTION SPEAKER | | |
| APPLICANT(S) FOR DO/EO/US Takeshi TAKEDA | | |
| <p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> The US has been elected in a Demand by the expiration of 19 months from the priority date (PCT Article 31) 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> a. <input type="checkbox"/> is attached hereto (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11. to 16. below concern document(s) or information included:</p> <ol style="list-style-type: none"> 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An Assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Courtesy copy of the first page of the International Publication (WO 00/76184). <input checked="" type="checkbox"/> Formal drawings, 1 sheet, Figure 1-1. <input checked="" type="checkbox"/> Courtesy Copy of the International Search Report. | | |

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| U.S. APPLICATION NO. (if known, see 37 CFR 1.5) <div style="font-size: 24pt; font-weight: bold;">09/762202</div> | International Application No. PCT/JP99/07350 | Attorney's Docket No. TAKEDA 11 |
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| 17. [xx] The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a)(1) - (5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... \$690.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)..... \$100.00 | <div style="border: 1px solid black; padding: 2px;">CALCULATIONS PTO USE ONLY</div> |
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| ENTER APPROPRIATE BASIC FEE AMOUNT = | | \$ 860.00 |
| Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | \$ |

| Claims as Originally Presented | Number Filed | Number Extra | Rate | | |
|---|--------------|--------------|-----------|------------------|--|
| Total Claims | 5 - 20 | | X \$18.00 | \$ | |
| Independent Claims | 1 - 3 | | X \$80.00 | \$ | |
| Multiple Dependent Claims (if applicable) | | | +\$270.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ 860.00 | |

| Claims After Post Filing Prel. Amend | Number Filed | Number Extra | Rate | | |
|--------------------------------------|--------------|--------------|-----------|------------------|--|
| Total Claims | - 20 | | X \$18.00 | \$ | |
| Independent Claims | - 3 | | X \$78.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ 860.00 | |

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| Reduction of 1/2 for filing by small entity, if applicable. Applicant claims small entity status. See 37 CFR 1.27. | | \$ 430.00 |
| SUBTOTAL = | | \$ 430.00 |
| Processing fee of \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | \$ |
| TOTAL NATIONAL FEE = | | \$ 430.00 |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + | | \$ |
| TOTAL FEES ENCLOSED = | | \$ 430.00 |

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| | Amount to be: refunded \$ charged \$ |
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a. [] A check in the amount of \$ _____ to cover the above fees is enclosed.

b. [X] Credit Card Payment Form (PTO-2038), authorizing payment in the amount of \$ 430.00, is attached.

c. [] Please charge my Deposit Account No. **02-4035** in the amount of \$ _____ to cover the above fees.
 A duplicate copy of this sheet is enclosed.

d. [XX] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment
 to Deposit Account No. **02-4035**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or
 (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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 REGISTRATION NUMBER

SPECIFICATION

MOBILE COMMUNICATION UNIT WITH BONE CONDUCTION SPEAKER

5 FIELD OF THE INVENTION

The present invention relates to a mobile communication unit provided with a bone conduction speaker, and more particularly to the mobile communication unit of a wrist-mounted type in which: an ordinary air-conduction speaker is removed from a main body of the mobile communication unit; and, in place of such ordinary speaker, a bone conduction speaker is detachably mounted on a finger tip of a user for receiving a voice sound without using the user's ears.

BACKGROUND OF THE INVENTION

In recent years, a mobile communication unit such as a cell phone unit, a PHS (personal handy-phone system) and the like has been considerably reduced in size and in weight. However, such a mobile communication unit has its essential construction remain substantially unchanged. In other words, the mobile communication unit is essentially constructed of its components contained in a single-piece casing, which components are, for example such as: a wireless telephone functional portion; a battery portion; a display portion; a control portion; a microphone portion; and, an ordinary air-conduction speaker portion. Consequently, in use, it is necessary for the user of such mobile communication unit to have his/her ear and mouth disposed adjacent to the air-conduction speaker portion and the microphone portion of the mobile communication unit, respectively. Due to this, it is difficult to further downsize the today's mobile communication unit having the above essential

construction.

Although there are various types of external components such as external ear phones and external microphones which are connected with the mobile communication system when used in place of the system's built-in speaker and microphone, any one of these external components is connected with the mobile communication system through an electric connecting cord. Due to the presence of this connecting cord, handling of such external components is relatively cumbersome, which impairs the mobile communication system in portability and in wearability (i.e., suitability for being worn or fit). This makes it difficult for the user of this type of mobile communication unit to immediately answer a telephone call.

In this connection, an ultra-compact mobile communication unit of a wrist-mounted type has been experimentally developed. However, in use, when the user has a speaker portion of this type of ultra-compact unit brought into contact with his/her ear to answer a phone call, it is impossible for the user to have a microphone portion of this ultra-compact unit disposed adjacent to his/her mouth, which makes it difficult for the microphone portion of the unit to catch the user's voice sound. Further, in the case where an external earphone is used in place of the speaker portion of this wrist-mounted type ultra-compact mobile communication unit, an electric connecting cord extending from the user's wrist to his/her ear is a must for such wrist-mounted type unit. However, the presence of this connecting cord impairs such wrist-mounted type unit in wearability (i.e., suitability for being worn).

As described above, the wrist-mounted type ultra-compact mobile communication unit, which is much smaller in size than a conventional cell phone and the like, suffers from various types

of disadvantages. Consequently, it is an object of the present invention to provide an ultra-compact mobile communication unit which is smaller in size and lighter in weight. Furthermore, this ultra-compact mobile communication unit enables a user thereof to easily perceive any sounds in communication even in a high-noise environment, and also enables the user to speak in a whisper without making the people around the user uncomfortable.

The ultra-compact mobile communication unit of the present invention may be any one of cell phones, personal handy-phone systems and the like, which one is characterized by its bone conduction speaker. This bone conduction speaker is separated from a main body of the mobile communication unit, and enables its user to catch any voice sound received by the mobile communication unit, without fail.

Further, the present invention is characterized in that the ultra-compact mobile communication unit is detachably mounted on an inner side of the user's wrist with the use of a band and the like.

Still further, the present invention is characterized in that the ultra-compact mobile communication unit uses a bone conduction speaker provided with a vibrating portion, wherein the vibrating portion of the bone conduction speaker has its rear surface formed into a finger-mounted portion which assumes a cap shape or a ring shape to enable the bone conduction speaker to be mounted on a finger tip of the user.

Further, the present invention is characterized in that an electric connecting cord through which the bone conduction speaker is electrically connected with a main body of the ultra-compact mobile communication unit is capable of being withdrawn into the

main body of the unit by using a take-up reel and like means which is mounted in the main body of the mobile communication unit.

Still further, the present invention is characterized in that the main body of the ultra-compact mobile communication unit is provided with a clip in a rear side of the main body, wherein the clip enables the main body of the mobile communication unit to be mounted on a band of the user's wrist watch.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a view illustrating an embodiment of the mobile communication unit of the present invention, wherein the mobile communication unit is provided with a bone conduction speaker.

BEST MODE FOR CARRYING OUT THE INVENTION

With reference to the accompanying drawing, an embodiment or best mode of the present invention will be described. As shown in Fig. 1, a mobile communication unit of the present invention is provided with a bone conduction speaker 1, and is constructed of: a main body casing 2 containing therein the bone conduction speaker 1, a speaker amplifier, a microphone amplifier and a battery; a microphone portion 3 which is disposed inside the main body casing 2 so as to be adjacent to a lower portion of the main body casing 2; and, an electric connecting cord 4 for electrically connecting the main body casing 2 with the bone conduction speaker 1. Incidentally, preferably, the connecting cord 4 is capable of being withdrawn into the main body casing 2 by using a take-up reel and like means.

The bone conduction speaker 1 is connected with the main body casing 2 through the connecting cord 4 which has a length of

approximately 15 cm. If necessary, a finger-mounted portion 5, which assumes a cap shape or a ring shape, is provided in a rear surface of a vibrating portion of the bone conduction speaker 1. The main body casing 2 of the mobile communication unit is mounted on an inner side of a wrist of the user by using a band 6 and the like. It is also possible to provide a clip in a rear side of the main body casing 2 of the mobile communication unit, through which clip the main body casing 2 of the mobile communication unit is mounted on a band of the user's wrist watch.

In the above construction of the present invention, when the user makes or answers a phone call, one or two of his/her fingers (in general, his/her first finger and thumb) is or are inserted into the finger-mounted portion 5 of the bone conduction speaker 1 to have the bone conduction speaker 1 brought into soft contact with his/her forehead, temple, cheekbone or an area between his/her eyes in order to catch a received voice sound. In the case of the sending of a phone call, since the microphone portion 3 of the main body casing 2 of the mobile communication unit mounted on the inner side of the user's wrist is capable of being disposed adjacent to the user's mouth, it is possible for the microphone portion 3 of the mobile communication unit to sufficiently catch the user's voice sound.

When the microphone portion 3 of the mobile communication unit is disposed in the inner side of the user's hand, it is possible for the user to cover his/her mouth with his/her hand while he/she talks with someone by using the mobile communication unit, which makes it possible for the user to speak in a whisper much smaller in level than that he/she uses in one-piece communication units such as a cell phone, a personal handy-phone system, a radio

communication unit or the like.

INDUSTRIAL APPLICABILITY

The present invention having the above construction is
5 characterized as follows:

- 1) it is possible for the user to have his/her ears be free from the built-in speaker portion of the mobile communication unit in use. This releases the mobile communication unit from its minimum size restriction on its heretofore required distance between the
10 mouth and the ear of the user, and therefore makes it possible to further downsize the main body of the mobile communication unit;
- 2) the mobile communication unit enables its user to easily perceive any voice sound in communication even in a high-noise environment, and also enables the user to speak in a whisper without
15 making the people around him/her uncomfortable, wherein such whisper is much smaller in sound level than that he/she uses in one-piece communication units such as a cell phone, a personal handy-phone system, a radio communication unit or the like;
- 3) the mobile communication unit is of a wrist-mounted type which
20 is excellent in wearability (i.e., suitability for being worn) and in portability when the mobile communication unit is not used, wherein the mobile communication unit of the wrist-mounted type enables its user to relax his/her position when he/she uses the mobile communication unit; and
- 25 4) since the mobile communication unit is capable of sending its received voice sound signal directly to the user's hearing organ by means of the bone conduction speaker, the mobile communication unit is helpful to even a user suffering from adventitious slight hearing loss due to his/her senility and the like.

Consequently, the above-mentioned characterized features of the present invention are capable of further fueling the demand for the mobile communication unit, and therefore have a large economic effect on the communication industry.

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | |

CLAIMS

1. A mobile communication unit such as a cell phone, a personal
handy-phone system and the like, characterized in that: a speaker,
5 through which a user listens for a received voice sound, is separated
from a main body of said mobile communication unit; and, said speaker
is a bone conduction speaker.

2. The mobile communication unit as set forth in claim 1,
10 characterized in that: said main body of said mobile communication
unit is mounted on an inner side of a user's wrist by means of a
band and the like.

3. The mobile communication unit as set forth in claim 1,
15 characterized in that: a finger-mounted portion is provided in a
rear surface of a vibrating portion of said bone conduction speaker,
wherein said finger-mounted portion of said bone conduction speaker
assumes a cap shape or a ring shape; and, said bone conduction speaker
is mounted on a finger tip of the user through said finger-mounted
20 portion thereof.

4. The mobile communication unit as set forth in claim 1,
characterized in that: an electric connecting cord for connecting
said bone conduction speaker with said main body of said mobile
25 communication unit is withdrawn into said main body of said mobile
communication unit by means of a take-up reel and like means.

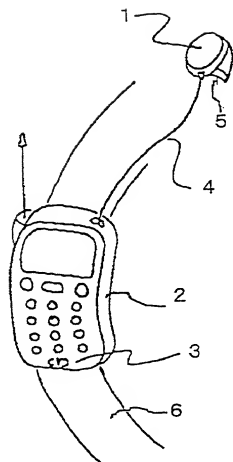
5. The mobile communication unit as set forth in claim 1,
characterized in that: a clip is provided in a rear side of said

main body of said mobile communication unit; and, said clip enables said main body of said mobile communication unit to be mounted on a band of a wrist watch of the user.

ABSTRACT OF THE DISCLOSURE

The object is to provide an ultra-compact mobile communication unit which is smaller in size and lighter in weight. Furthermore, this ultra-compact mobile communication unit enables a user thereof to easily perceive any sounds in communication even in a high-noise environment, and also enables the user to speak in a whisper without making the people around the user uncomfortable. The ultra-compact mobile communication unit is characterized by its bone conduction speaker 1. This bone conduction speaker 1 is separated from the mobile communication unit's main body 2, and used in place of the mobile communication unit's main body's speaker and an external earphone connected with the mobile communication unit.

FIG. 1



Combined Declaration for Patent Application and Power of Attorney

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name, and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MOBILE COMMUNICATION UNIT WITH BONE CONDUCTION SPEAKER

the specification of which (check one)

- ☐ is attached hereto,
☐ was filed in the United States under 35 U.S.C. §111 on _____, as
 U.S. Appl. No. _____*, or
☐ was/will be filed in the U.S. under 35 U.S.C. §371 by entry into the U.S. national stage of an international
 (PCT) application, PCT/_____; filed _____, entry requested on
 _____*; national stage application received U.S. Appl. No. _____*; §371/§102(e)
 date _____* (* if known)

and was amended on _____ (if applicable).

(include dates of amendments under PCT Art. 19 and 34 if PCT)

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above; and I acknowledge the duty to disclose to the Patent and Trademark Office (PTO) all information known by me to be material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §§ 119 (a)-(d) and 365 (b) of any prior foreign application(s) for patent or inventor's certificate, or §365(a) of any prior PCT application(s) designating a country other than the U.S., listed below with the "Yes" box checked, and have also identified below, by checking the "No" box, any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application on which priority is claimed:

| | | | |
|------------------|--------------|------------------------|---------|
| <u>11-156262</u> | <u>Japan</u> | <u>June 3, 1999</u> | K] [] |
| (Number) | (Country) | (Day Month Year Filed) | YES NO |
| _____ | _____ | _____ | [] [] |
| (Number) | (Country) | (Day Month Year Filed) | YES NO |

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional applications listed below:

| | |
|-------------------|------------------------|
| _____ | _____ |
| (Application No.) | (Day Month Year Filed) |
| _____ | _____ |
| (Application No.) | (Day Month Year Filed) |

I hereby claim the benefit under 35 U.S.C. §120 of any prior U.S. non-provisional application(s) or under §365(c) of any prior PCT international application(s) designating the U.S., listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in such U.S. or PCT international application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the PTO all information which is material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

| | | |
|-------------------|------------------------|--|
| _____ | _____ | _____ |
| (Application No.) | (Day Month Year Filed) | (Status: patented, pending, abandoned) |
| _____ | _____ | _____ |
| (Application No.) | (Day Month Year Filed) | (Status: patented, pending, abandoned) |

As a named inventor, I hereby appoint the following registered practitioners to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

All of the practitioners associated with Customer Number 001444

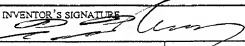
Direct all correspondence to the address associated with **Customer Number 001444**, which is presently:

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 624 Ninth Street, N.W.
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The undersigned hereby authorizes the U.S. Attorneys or Agents appointed herein to accept and follow instructions from _____ as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. Attorneys or Agents and the undersigned. In the event of a change of the persons from whom instructions may be taken, the U.S. Attorneys or Agents appointed herein will be so notified by the undersigned.

Title: _____
 U.S. Application filed _____, Serial No. _____
 PCT Application filed _____, Serial No. _____

I hereby further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

| | | | |
|---|--|---|---------------------------|
| FULL NAME OF FIRST INVENTOR Takeshi TAKEDA | | INVENTOR'S SIGNATURE  | DATE December 10, 2000 |
| RESIDENCE Tokyo, Japan | | CITIZENSHIP Japanese | |
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| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |
| FULL NAME OF THIRD JOINT INVENTOR | | INVENTOR'S SIGNATURE | DATE |
| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |
| FULL NAME OF FOURTH JOINT INVENTOR | | INVENTOR'S SIGNATURE | DATE |
| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |
| FULL NAME OF FIFTH JOINT INVENTOR | | INVENTOR'S SIGNATURE | DATE |
| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |
| FULL NAME OF SIXTH JOINT INVENTOR | | INVENTOR'S SIGNATURE | DATE |
| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |
| FULL NAME OF SEVENTH JOINT INVENTOR | | INVENTOR'S SIGNATURE | DATE |
| RESIDENCE | | CITIZENSHIP | |
| POST OFFICE ADDRESS | | | |

ALL INVENTORS MUST REVIEW APPLICATION AND DECLARATION BEFORE SIGNING. ALL ALTERATIONS MUST BE INITIALED AND DATED BY ALL INVENTORS PRIOR TO EXECUTION. NO ALTERATIONS CAN BE MADE AFTER THE DECLARATION IS SIGNED. ALL PAGES OF DECLARATION MUST BE SEEN BY ALL INVENTORS.